

CLAIMS

1. A fluid-working machine having a plurality of working chambers of cyclically changing volume, a high-pressure fluid manifold and a low-pressure fluid manifold, at least one valve linking each working chamber to each manifold, and electronic sequencing means for operating said valves in timed relationship with the changing volume of each chamber, wherein the electronic sequencing means is arranged to operate the valves of each chamber in one of an idling mode, a partial mode in which only part of the usable volume of the chamber is used, and a full mode in which all of the usable volume of the chamber is used, and the electronic sequencing means is arranged to select the mode of each chamber on successive cycles so as to vary the time averaged effective flow rate of fluid through the machine.
2. A machine according to claim 1, wherein the partial mode comprises the use of only a small fraction of the usable volume of the chamber.
3. A machine according to claim 1 or 2, operable as both a pump and a motor, each chamber having five selectable modes, namely idling mode, partial motoring mode, full motoring mode, partial pumping mode and full pumping mode.
4. A machine according to claim 1, 2 or 3, wherein the working chambers comprise cylinders in which pistons are arranged to reciprocate.
5. A machine according to claim 4, wherein partial pumping mode includes closing the valve linking the cylinder to the low-pressure manifold and opening the valve linking the cylinder to the high-pressure manifold a small fraction in advance of the top dead centre position of the piston.
6. A machine according to claim 4, wherein partial motoring mode includes closing the valve linking the cylinder to the high-pressure manifold and opening the valve linking the cylinder to the low-pressure manifold a small fraction after the top dead centre position of the piston.

7. A method of operating a fluid-working machine having a plurality of working chambers of cyclically changing volume, a high-pressure fluid manifold and a low-pressure fluid manifold, at least one valve linking each working chamber to each manifold, comprising operating the valves of each chamber in one of an idling mode, a partial mode in which only part of the usable volume of the chamber is used, and a full mode in which all of the usable volume of the chamber is used, wherein the mode of each chamber is selected on successive cycles so as to vary the time averaged effective flow rate of fluid through the machine.
- 10 8. A method according to claim 7, wherein the partial mode comprises the use of only a small fraction of the usable volume of the chamber.
- 15 9. A method according to claim 7 or 8, comprising selecting the number of chambers to be operated in each of said modes according to an algorithm depending on the actual and required output of the machine.
10. A method according to claim 9, including a preliminary step of selecting whether to operate the machine as a pump or a motor, and choosing the algorithm accordingly.